

**RSPC Review Request
For
PSS Generation 3 Mode Shutter Kirk Lock Interface**

The SI Group is requesting a change in the way Kirk Locks on mode shutters are interfaced to the PSS. This applies only to the PSS Generation 3 design not the existing PSS version I and II implementations.

Current Implementation in PSS version I and II Designs

Overview

The Kirk Locks referred to in the following mode shutter description are monitored by the PSS chain A PLC. ***APS policy requires the shutter to be mechanically locked while acting as a white beam stop (see section 4.2.6.3.1.2 “Monochromatic Beam” in the SAD).***

The P4 and P6 Mode shutters are two state devices. The P4-20 shutter is used with ID (Insertion Device) Beamlines and the P6-20 is used with BM (Bending Magnet) Beamlines. They may be placed in a Mono Mode or in a Non-Mono Mode (Pink or White Mode). The Mode the shutter is in determines the type of beam that will pass through the device. There are no other valid operational positions of these shutters. These shutters may not assume an intermediate operating position. The beam line must have a valid mode selected to allow operation of any other shutter including the Front End Shutters (FES).

Mono Mode Operation

In the Mono Mode the shutter will block or stop white beam and acts as a white beam stop. ***APS policy requires the shutter to be mechanically locked while acting as a white beam stop.*** Therefore, the PS (Photon Stop) and the SS (Safety Stop) of the shutter are mechanically locked in position by Kirk lock plungers in this Mode. Additionally, the MS1 and MS2 portion of the shutter acts as an integral shutter, passing Mono beam when open and blocking or stopping Mono beam when closed. In Mono Mode the shutter requires the external user signal BL-EPS (Beam Line Equipment Protection System) permit to open MS1 and MS2 and pass Mono beam. If this permit is not present the shutter (MS1 and MS2) will not open. If this permit is removed while the shutter is open, the shutter (MS1 and MS2) will close. Note: the removal of any permit for an open shutter will not generate a fault, it will simply close the shutter. The shutter also requires the PSS system to determine that the down stream critical section is Beam Ready. A beam line critical section is the area from a beam blocking or stopping device (shutter) controlled by PSS, in the direction of beam travel, to the next beam blocking or stopping device. There are two special cases of beam blocking or stopping devices in addition to a shutter controlled by PSS. A closed MBS (Manual Beam Stop) or the fixed beam stop

located at the end of the last station in the beam line. The experimental station behavior for stations located down stream of a closed MBS is modified such that only pneumatic door control logic remains functional. The closed MBS becomes the end of the beam line.

Non-Mono Mode (White or Pink Mode) Operation

In Non-Mono Mode (White or Pink Mode) the shutter will block or stop any Mono beam that may be present and will pass the Non-Mono (White or Pink) beam. In this mode the shutter is effectively removed from the beam path and the control of the beam presence or absence is performed by the next up-stream (in the direction opposite beam travel) shutter. The next up-stream shutter is usually the FES (Front End Shutter). The shutter is open to pass Non-Mono beam.

P4/P6 MODE CONTROL

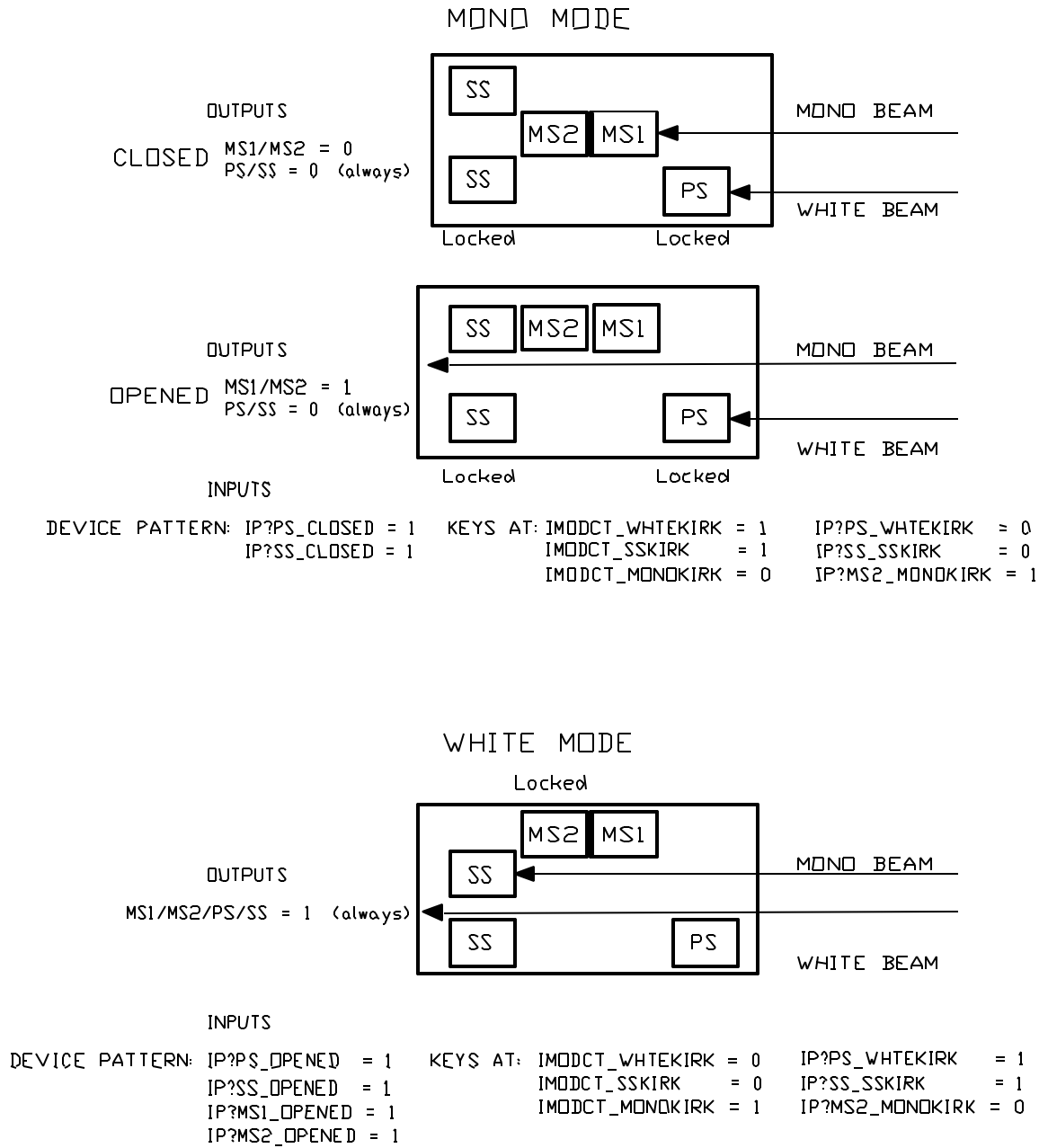


Figure 1. General Schematic of Mode Shutter.

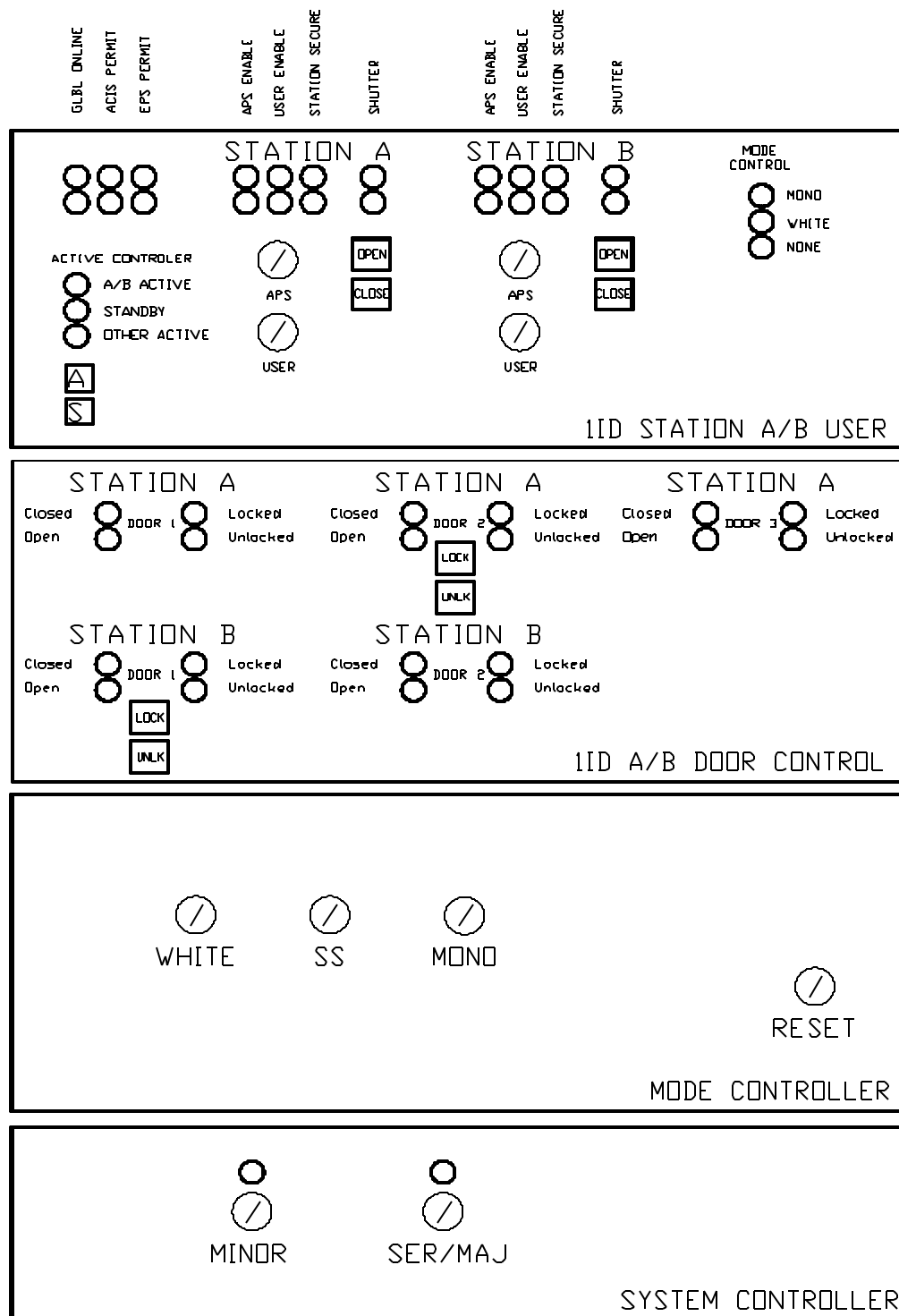
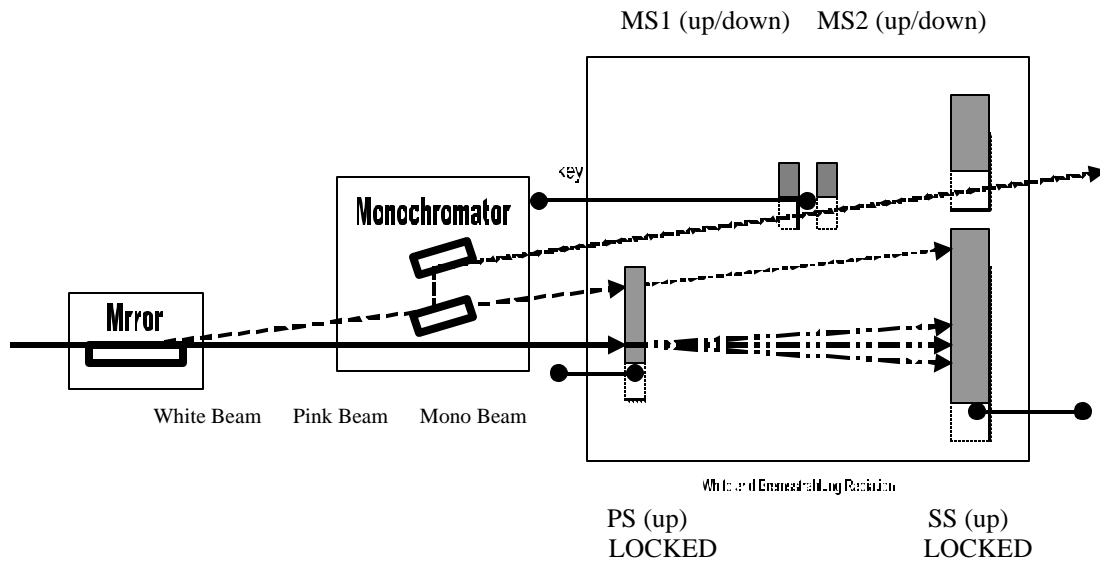


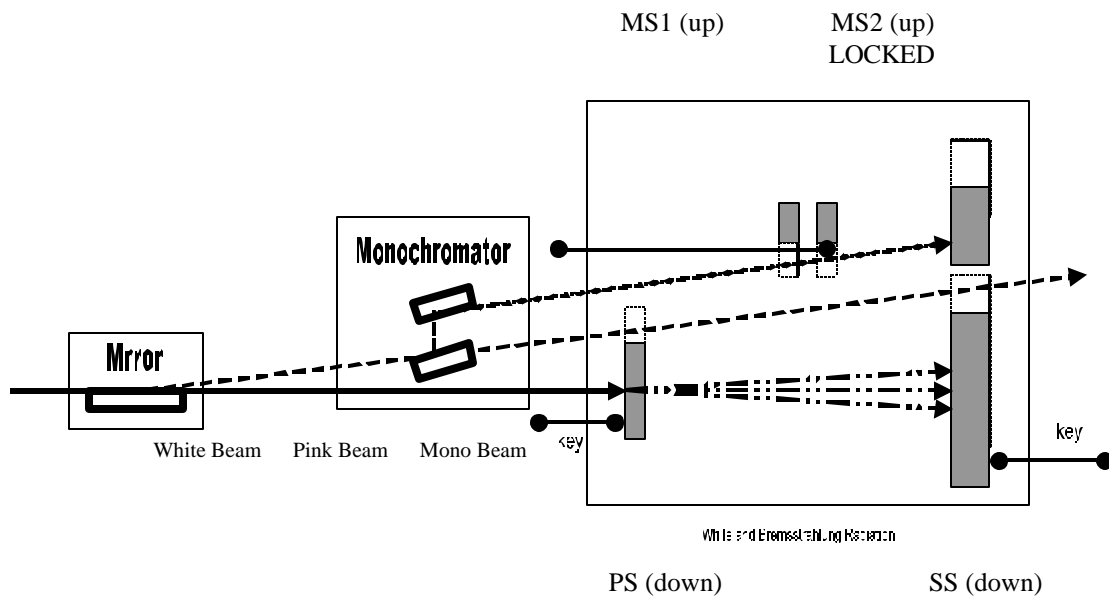
Figure 2. Typical schematic of PSS Control Panels including a Mode Controller.

2-BM P6-20 Integral Shutter

Mono Beam Mode



Pink Beam Mode



Notes:

PS - Photon Shutter, water cooled

SS – Safety Stop

MS1 – Mono Shutter 1, MS2 – Mono Shutter 2

●—● - Kirk Locks

Proposed Change

The PSS Generation 3 design, in summary, has three processor units or chains as compared to only two such chains in the PSS version I system. Both of the two chains in the PSS version I system are considered safety critical even though some of the functionality of these chains is not safety critical such as command and control operation of the doors and shutters. PSS version I has only two chains thus command and control functionality is a part of chain A. However, in the PSS generation 3 design one has the ability to locate the non-safety critical functionality in the third processor or chain C as it is currently called. This third chain in the PSS generation 3 design is not considered a trusted system thus it is used to perform non-safety critical functions. Another aspect of an un-trusted system, at least in this case, is that an acceptance test will be conducted at commissioning and no other periodic tests/validations are planned. Testing will be done as changes are made to the PSS generation 3 chain C system.

The SI Group is requesting that the Kirk Lock status (i.e. plunger extended or withdrawn) be located in chain C of Generation 3 PSS. The reasons for the change are as follows:

1. Locking of the white beam stop in the mode shutter by Kirk Locks may be an administrative configuration procedure and does not need to be a part of the PSS safety critical code.
2. The position of the white beam stop in the mode shutter is monitored by the safety critical code in both A and B chains. Thus, if it is not in the expected position a PSS fault will be generated.
3. Removing non-safety critical functionality from chains A and B will simplify the remaining code in chains A and B.

The SI Group contends that this proposed change to the PSS chain code does not violate the PSS safety envelope because:

- The APS SAD does not specify that the mechanism for locking the white beam stop must be monitored by the PSS (See section 4.2.6.3.1.2 “Monochromatic Beam” of the SAD). In theory, the Kirk keys could be “kept” by the Floor Coordinators to ensure that the white beam stop is and stays locked. Thus, we are saying that once the mode shutter is locked, that monitoring the location of the Kirk keys with an un-trusted system (i.e. PSS Gen 3 chain C) is equal to having the Floor Coordinators capture and keep these keys.